



3 Amigos used to solve problems involving 1-D Motion and freefall



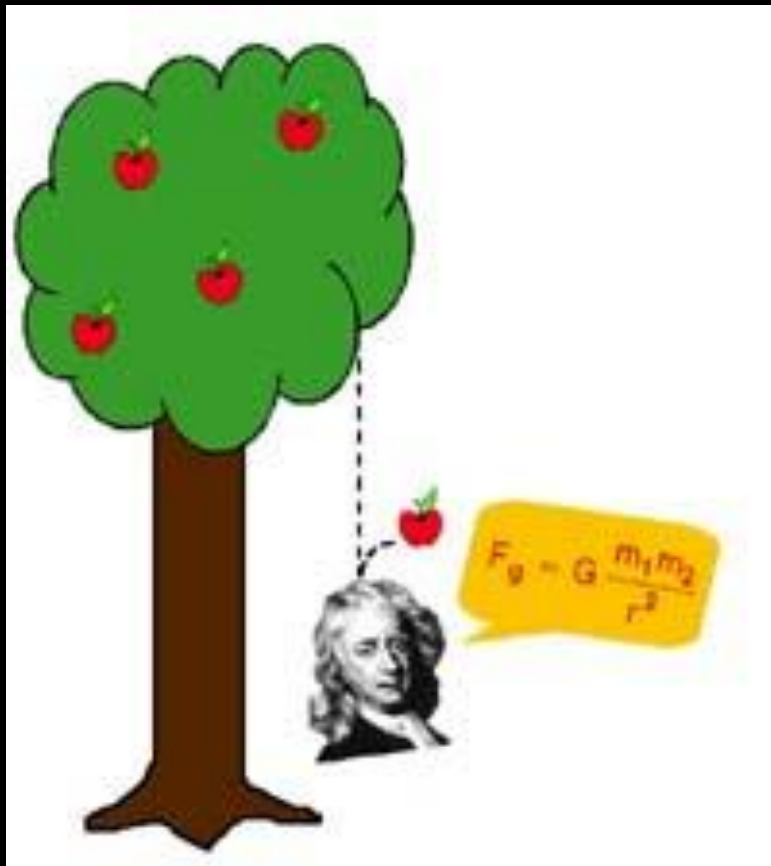
FREE FALL



What does it mean to be in free fall?

Free fall occurs when an object is pulled down by the gravitational force of the Earth or any other large gravitation body.

FORCE



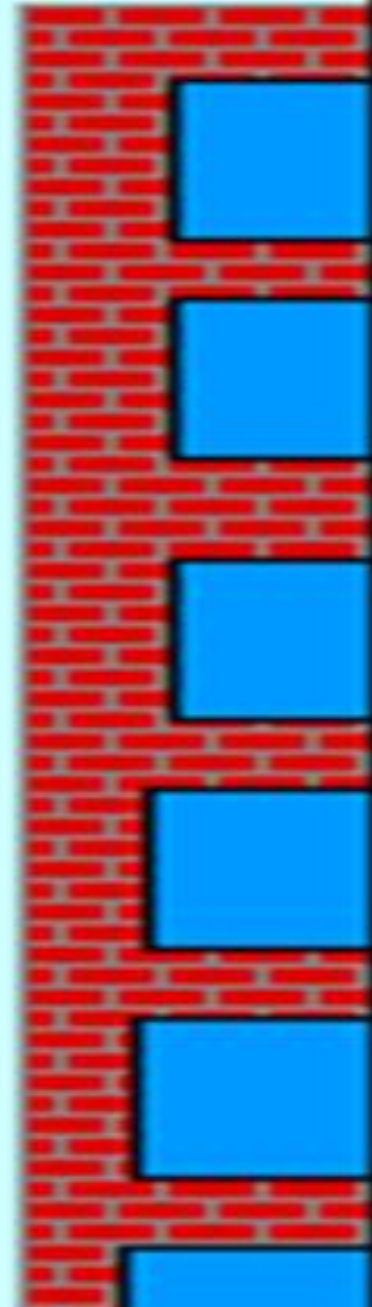
A force is a push or pull.

A force can cause an object's velocity to change.



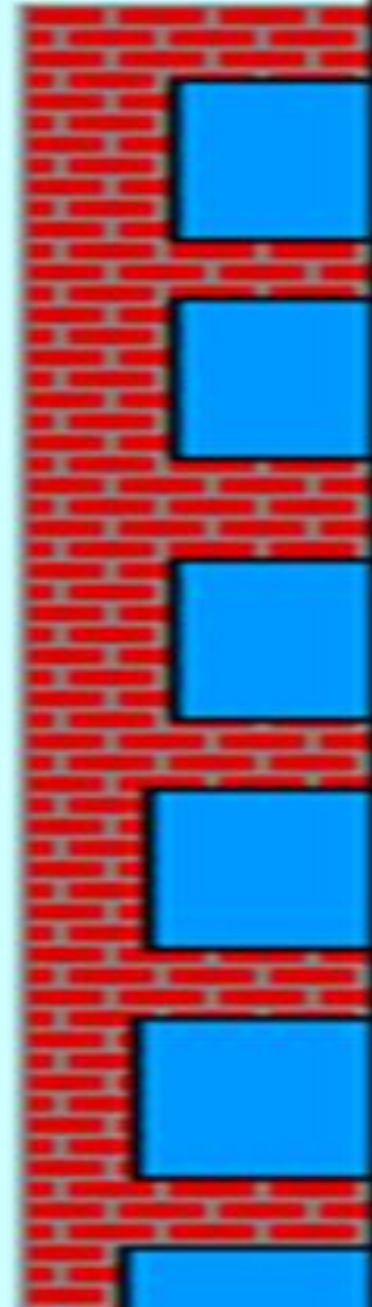
Gravity

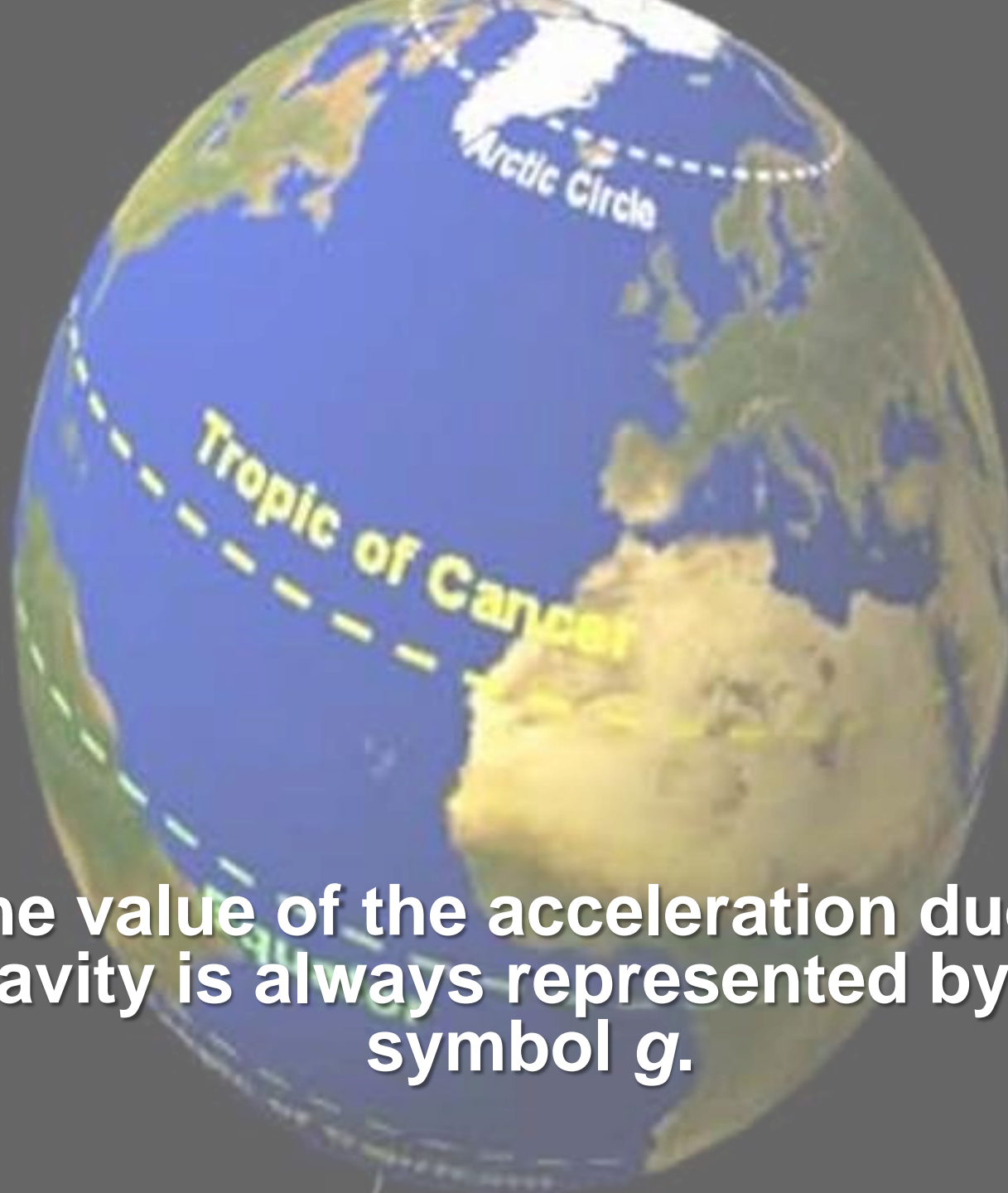
- **Acceleration due to gravity**
- Experienced by *any* object that is falling freely close to the Earth's surface
- A constant.
- It has the same value, **9.8 m/s^2** , *irrespective of the mass of the object.*





**What is the value
of Gravity on
Earth?**





- The value of the acceleration due to gravity is always represented by the symbol g .

Million Dollar Question

If I drop a hammer and a feather from the same height (ignoring air resistance), which will hit the ground first?

Why?

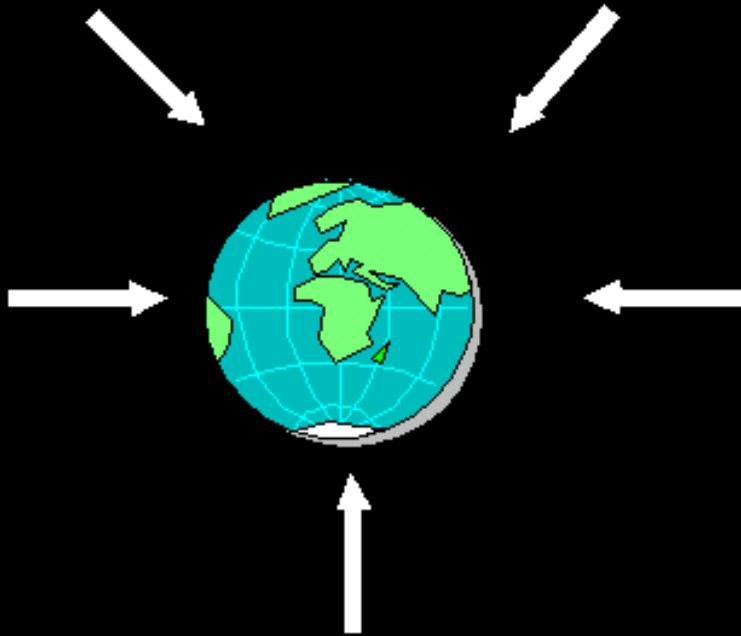


Apollo 15 experiment

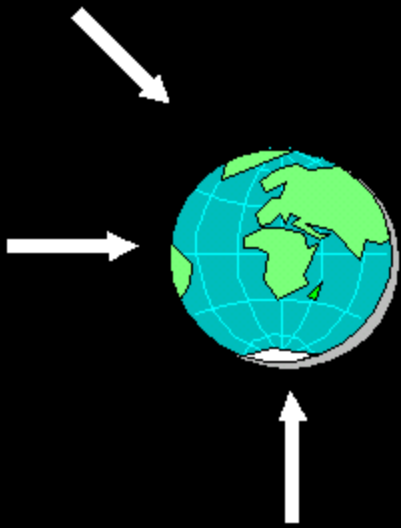
- Astronaut David Scott experiments with free-falling objects
- Does mass impact the speed they fall?



GRAVITY



- Gravity is a force that attracts objects together.
- On earth this force attracts everything to Earth.



GRAVITY

- Gravity is a force that for us is always directed downwards.
- But to say that gravity acts downwards is not correct.

Where does it act?



GRAVITY



- Gravity acts down, no matter where you stand on the Earth.

- It is better to say that on Earth gravity pulls objects towards the center of the Earth.

- So no matter where you are on Earth all objects fall to the ground.



GRAVITY

The Earth is a very large object and it is also very heavy. This means that it has got a strong gravitational field.

The moon is smaller than the Earth and is not as heavy.

Would you expect its gravity to be stronger or weaker than the Earth's gravity?

GRAVITY



I would write the moon's gravity in my flip chart!



- Because of its smaller size, the Moon's gravity is one-sixth of the Earth's gravity, as we saw demonstrated by the giant leaps of the Apollo astronauts

$$\frac{9.8 \text{ m/s}^2}{6} = 1.63 \text{ m/s}^2$$

Freefall and the The 3 Amigos



In introductory mechanics there are three equations that are used to solve kinematics problems

$$v_f = v_i + at$$

Units: v_f (m/s), v_i (m/s), a (m/s²), t (s)

$$d = v_i t + \frac{1}{2} at^2$$

Units: d (m), v_i (m/s), t (s), a (m/s²), t^2 (s²)

$$v_f^2 - v_i^2 = 2ad$$

Units: v_f^2 (m/s²), v_i^2 (m/s²), a (m/s²), d (m)

Resources

<http://www.onlinephys.com/kinematics1Dc.html>

<http://openlearn.open.ac.uk/mod/resource/view.php?id=171667&direct=>

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